

Activity 9-4

Derivatives of Hydrocarbons I

Introduction

Most organic compounds are named from, and can be considered related to, corresponding hydrocarbons. Homologous series of such hydrocarbon derivatives occur when one or more hydrogen atoms of the hydrocarbon have been replaced by other atoms or groups. The alcohols, in which one or more hydrogen atoms have been replaced by —OH groups, make up one such group of hydrocarbon derivatives.

1. In alcohols, one or more of the hydrogen atoms of a hydrocarbon have been replaced by _____.
2. The number of —OH groups that can be attached to one carbon atom under ordinary conditions is _____.
3. Why are alcohols not considered Arrhenius bases under ordinary conditions? _____

Classifying alcohols

4. Alcohols may be classified according to the number of —OH groups in the molecule. What does each of these terms mean as applied to alcohols?
 - a. Monohydroxy (monohydric) _____
 - b. Dihydroxy (dihydric) _____
 - c. Trihydroxy (trihydric) _____
5. Alcohols may also be classified according to the number of carbon chains attached to the carbon having the —OH group. What is a primary carbon atom?

How does a primary carbon atom compare to secondary and tertiary carbon atoms?

6. What is a primary alcohol? _____

7. Where is the —OH group found on the chain of carbon atoms in a molecule of any primary alcohol? _____

8. What is the general formula for a primary alcohol?

9. a. In the space below, give the IUPAC names, molecular formulas, and structural formulas for the first three primary alcohols.

b. Give the IUPAC names and structural formulas for the two isomers of C_4H_9OH that are primary alcohols.

c. Give the IUPAC names and structural formulas for the four isomers of $C_5H_{11}OH$ that are primary alcohols.

Secondary and tertiary alcohols

10. What is a secondary alcohol? _____

11. What is the general formula for a secondary alcohol?
12. Give the IUPAC names, molecular formulas, and structural formulas for the secondary alcohols that have 3 and 4 carbon atoms.
13. Give the IUPAC names and structural formulas for the three isomers of $C_5H_{11}OH$ that are secondary alcohols.
14. What is a tertiary alcohol? _____

15. What is the general formula for a tertiary alcohol?

16. Give the IUPAC names, molecular formulas, and structural formulas for the tertiary alcohols that have 4 and 5 carbon atoms.

Dihydroxy and trihydroxy alcohols

17. What is a dihydroxy alcohol? _____

18. Give the common name and structural formula for 1, 2-ethanediol.

19. What is a trihydroxy alcohol? _____

20. Give the IUPAC name and structural formula for glycerol.

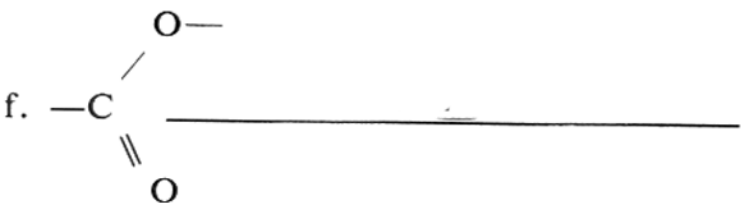
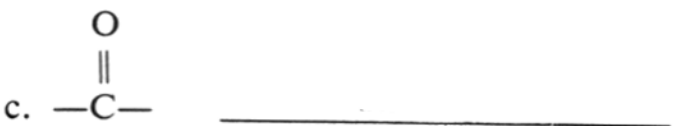
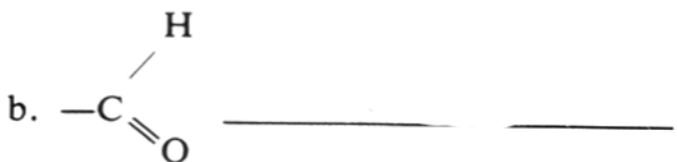
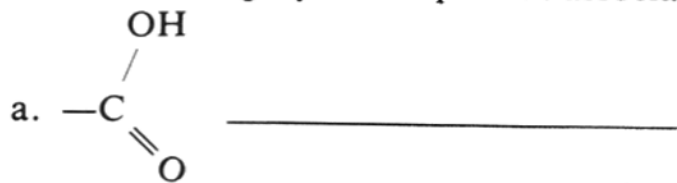
Activity 9-5

Derivatives of Hydrocarbons II

Functional groups

1. What is a functional group? _____

2. Name the category of compounds associated with each of the following functional groups.



Acids

3. What is the general formula for an organic acid? _____ Give the structural formula, common name, and IUPAC name for each of the following acids.



Aldehydes, ketones, and ethers

4. What is the general formula for an aldehyde? _____ Give the structural formula and IUPAC name for each of the following aldehydes.



5. What is the general formula for a ketone? _____ Give the structural formula, common name, and IUPAC name for the simplest ketone, CH_3COCH_3 .

6. What is the general formula for an ether? _____ Give the structural formula and name for the ether $\text{C}_2\text{H}_5\text{OC}_2\text{H}_5$.